



Details			
Campus	Higashi Kasai, Tokyo	Date	
Name of student		Class	X
Name of examination	Pre-Board 3	Student Roll No.	
Subject	Mathematics		
Session	2020 - 2021		
Duration	3 hours		
Maximum marks	80		

GENERAL INSTRUCTIONS

- For students of Classes 1 - 4, use 2B or HB lead pencil.
For students of Classes 5 and above, write in dark blue or black pen.
- Please check that this question paper contains 11 printed pages.
- Please check that this question paper contains 36 questions.
- The number of marks is given in brackets [] at the end of each question or part question.
- Please write down the serial number of the question before attempting.
- Do not use paper clips, highlighters, glue, or correction fluid.
- At the end of the examination, fasten all your work securely together.

EXAM-SPECIFIC INSTRUCTIONS

- Explain why $(3 \times 5 \times 7) + 7$ is a composite number?

OR

Without performing the long division, find whether $\frac{1}{11}$ have terminating or non-terminating (repeating) decimal expansion. Give a reason for your answer.

1. The nature of roots of the quadratic equation $2x^2 - 2x - 3 = 0$?

2. For what value of k the following pair of linear equation has a unique solution?



Maximum Marks: 80

Time Allowed: 3 hours

General Instructions:

- This question paper contains two parts A and B.
- Both Part A and Part B have internal choices.

Part – A consists 20 questions

- Questions 1-16 carry 1 mark each. Internal choice is provided in 5 questions.
- Questions 17-20 are based on the case study. Each case study has 5 case-based sub-parts.
An examinee is to attempt any 4 out of 5 sub-parts.

Part – B consists 16 questions

- Question No 21 to 26 are Very short answer type questions of 2 mark each.
- Question No 27 to 33 are Short Answer Type questions of 3 marks each
- Question No 34 to 36 are Long Answer Type questions of 5 marks each.
- Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

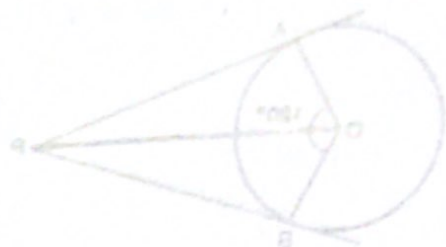
Part-A

- Explain why $(3 \times 5 \times 7) + 7$ is a composite number?

OR

Without performing the long division, find whether $\frac{987}{10500}$ have terminating or non-terminating (repeating) decimal expansion. Give a reason for your answer.

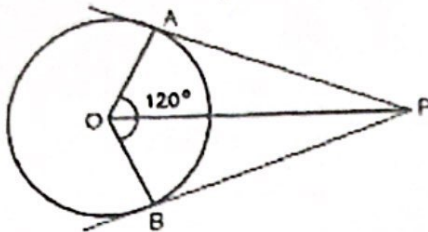
- What is the nature of roots of the quadratic equation $5x^2 - 2x - 3 = 0$?
- For what value of k the following pair of the linear equation has a unique solution?



$$kx + 3y = 3$$

$$12x + ky = 6$$

4. In the figure, PA and PB are tangents to a circle with centre O. If $\angle AOB = 120^\circ$, then find $\angle OPA$.



5. Find the value of x for which the numbers $(5x+2)$, $(4x-1)$ and $(x+2)$ are in AP.

OR

If in an A.P, $a = 15$, $d = -3$ and $a_n = 0$, then find the value of n

6. How many three-digit numbers are divisible by 9?
7. Write the discriminant of the quadratic equation $4x^2 - px + 12 = 0$

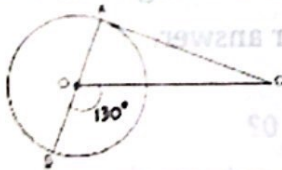
OR

Using quadratic formula solve the quadratic equation : $2x^2 - 11x + 9 = 0$

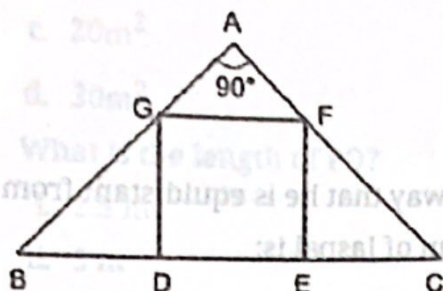
8. A line m is tangent to the circle with radius 5 cm. Find the distance between the centre and the line m .
9. What do you say about the line which is perpendicular to the radius of the circle through the point of contact?

OR

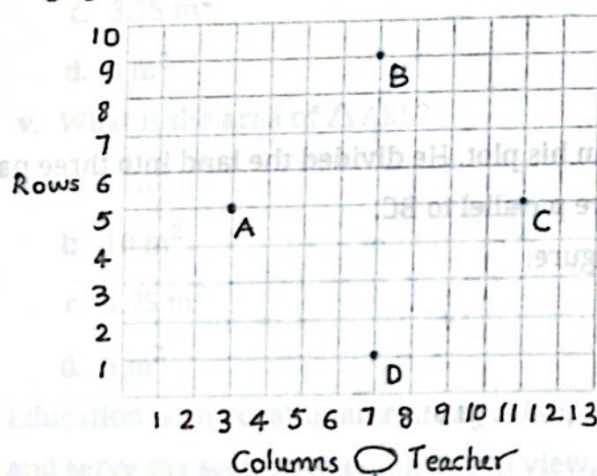
In the given figure, AOB is a diameter of the circle with centre O and AC is a tangent to the circle at A. If $\angle BOC = 130^\circ$, then find $\angle ACO$



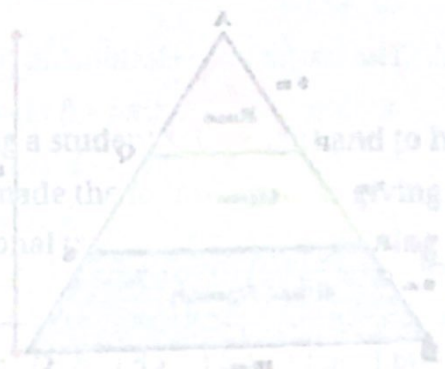
10. In Fig. DEFG is a square and $\angle BAC = 90^\circ$. Prove that $\triangle AGF \sim \triangle DBG$



11. The n^{th} term of an A.P. is $(5n - 2)$. Find its First term.
12. Write the value of $3 \cot^2 \theta - 3 \operatorname{cosec}^2 \theta$
13. If $\cos \theta = \frac{2}{3}$, write the value of $\frac{(\sec \theta - 1)}{(\sec \theta + 1)}$.
14. A cone of height 24 cm and radius of base 6 cm is made up of modelling clay. Find the volume of the cone.
15. If $2x, x + 10, 3x + 2$ are in A.P., find the value of x .
16. Two dice are thrown simultaneously. Find the probability of getting a multiple of 2 on one dice and a multiple of 3 on the other.
17. Students of a school are standing/seating in rows and columns in their playground for Yoga practice. A, B, C and D are the positions of four students as shown in the figure.



- I. The positions of A, B respectively are:
 - a. $(3, 5), (8, 7)$
 - b. $(3, 5), (9, 7)$
 - c. $(3, 5), (7, 9)$
 - d. $(5, 3), (7, 9)$
- II. The distance between A and B is:
 - a. $\sqrt{32}$ units



- b. $\sqrt{23}$ units
- c. $\sqrt{42}$ units
- d. $\sqrt{35}$ units

iii. It is possible to place Jaspal in the drill in such a way that he is equidistant from each of the four students A, B, C and D then the Position of Jaspal is:

- a. (3, 7)
- b. (3, 5)
- c. (5, 7)
- d. (7, 5)

iv. The distance between A and C is

- a. 8 units
- b. 6 units
- c. 4 units
- d. $\sqrt{32}$ units

v. The positions of C and B respectively are:

- a. (11, 5), (9, 7)
- b. (11, 5), (7, 9)
- c. (5, 11), (7, 9)
- d. (11, 7), (5, 9)

18. Shankar is having a triangular open space in his plot. He divided the land into three parts by drawing boundaries PQ and RS which are parallel to BC. Other measurements are as shown in the figure.



i. What is the area of this land?

- a. 120m^2
- b. 60m^2

- c. 20m^2
d. 30m^2
- ii. What is the length of PQ?
i. 2.5 m
ii. 5 m
iii. 6 m
iv. 8 m
- iii. The length of RS is
a. 5 m
b. 6 m
c. 8 m
d. 4 m
- iv. Area of $\triangle APQ$ is
a. 7.5m^2
b. 10m^2
c. 3.75m^2
d. 5m^2
- v. What is the area of $\triangle ARS$?
a. 21.6m^2
b. 10m^2
c. 3.75m^2
d. 6m^2

19. Education with vocational training is helpful in making a student self-reliant and to help and serve the society. Keeping this in view, a teacher made the following table giving the frequency distribution of a student undergoing vocational training from the training institute.

Age (in years)	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-above
Frequency(no. of participants)	62	132	96	37	13	8	6	4	4	3



- i. Median class of above data:
- 20 - 24
 - 20.5 - 24.5
 - 19.5 - 24.5
 - 24.5 - 29.5
- ii. Calculate the median.
- 24.06
 - 30.07
 - 24.77
 - 42.07
- iii. The empirical relationship between mean, median, mode:
- Mode = 3 Median + 2 Mean
 - Mode = 3 Median - 2 Mean
 - Mode = 3 Mean + 2 Median
 - 3 Mode = Median - 2 Mean
- iv. If mode = 80 and mean = 110, then find the median.
- 200
 - 500
 - 190
 - 100
- v. The mode is the:

Age (in years)	Frequency (no. of participants)
12-13	62
13-14	132
14-15	98
15-16	37
16-17	13
17-18	8
18-19	6
19-20	4



- a. middlemost frequent value
- b. least frequent value
- c. maximum frequent value
- d. none of these

20. Mathematics teacher of a school took her 10th standard students to show Red fort. It was a part of their educational trip. The teacher had interest in history as well. She narrated the facts of Red fort to students. Then the teacher said in this monument one can find a combination of solid figures. There are 2 pillars which are cylindrical in shape. Also 2 domes at the corners which are hemispherical. 7 smaller domes at the centre. Flag hoisting ceremony on Independence Day takes place near these domes.



- i. How much cloth material will be required to cover 2 big domes each of radius of 2.5 meters? (Take $\pi = 22/7$)

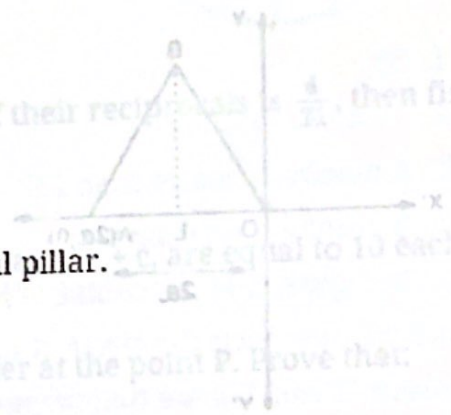
- a. 75 m^2
- b. 78.57 m^2
- c. 87.47 m^2
- d. 25.8 m^2

- ii. Write the formula to find the volume of a cylindrical pillar.

- a. $\pi r^2 h$
- b. $\pi r l$
- c. $\pi r(l + r)$
- d. $2\pi r$

- iii. Find the lateral surface area of two pillars if the height of the pillar is 7m and the radius of the base is 1.4m.

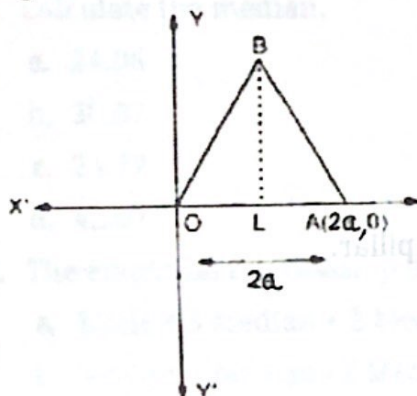
- a. 112.3 cm^2
- b. 123.2 m^2
- c. 90 m^2



- d. 345.2 cm^2
- iv. How much is the volume of a hemisphere if the radius of the base is 3.5m ?
- a. 85.9 m^3
b. 80 m^3
c. 98 m^3
d. 89.83 m^3
- v. What is the ratio of the sum of volumes of two hemispheres of radius 1cm each to the volume of a sphere of radius 2 cm ?
- a. 1:1
b. 1:8
c. 8:1
d. 1:16

Part-B

21. Without actual division, show that a rational number $\frac{66}{180}$ is a nonterminating repeating decimal.
22. Find the coordinates of the vertices of an equilateral triangle of side $2a$ as shown in the figure.



OR

Find the co-ordinates of the points which divide the line segment joining the points $(-4, 0)$ and $(0, 6)$ in four equal parts.

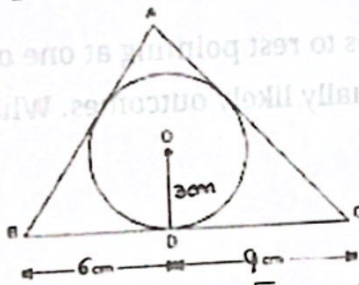
23. If α and β are the zeroes of the polynomial $2y^2 + 7y + 5$, then find the value of $\alpha + \beta + \alpha\beta$
24. Draw a line segment of length 8 cm and divide it in the ratio $3 : 2$. Measure the two parts.

25. Prove that $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$ where the angles involved are acute angles for which the expressions are defined.

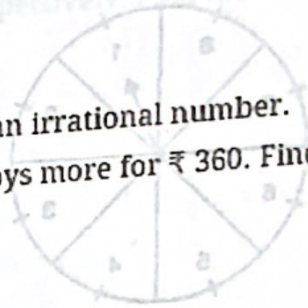
OR

Find the value of x in $\tan 3x = \sin 45^\circ \cos 45^\circ + \sin 30^\circ$.

26. In the figure, a triangle ABC is drawn to circumscribe a circle of radius 3 cm, such that the segments BD and DC are respectively of lengths 6 cm and 9 cm. If the area of $\triangle ABC$ is 54 square centimeter, then find the lengths of sides AB and AC.



27. Prove that $2 + 5\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.
28. If the list price of a toy is reduced by ₹ 2, a person can buy 2 toys more for ₹ 360. Find the original price of the toy.



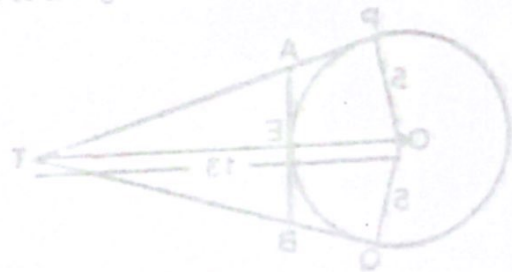
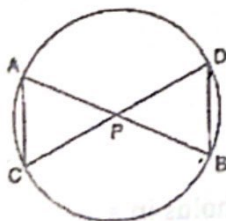
OR

The difference of two numbers is 4. If the difference of their reciprocals is $\frac{4}{21}$, then find the two numbers.

29. If the sum and product of the zeroes of the polynomial $ax^2 - 5x + c$, are equal to 10 each, find the value of 'a' and 'c'.

30. In the figure, two chords AB and CD intersect each other at the point P. Prove that:

- $\triangle APC \sim \triangle DPB$
- $AP \cdot PB = CP \cdot DP$

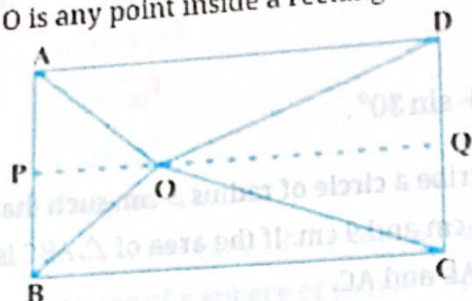


33. The table below shows the daily expenditure on the food of 25 households.

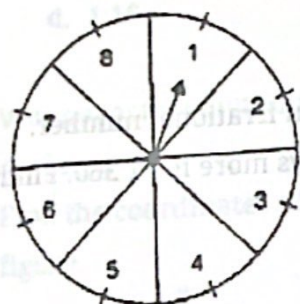
Daily expenditure (₹)	Number of households
100-150	4
150-200	3
200-250	2
250-300	1

OR

O is any point inside a rectangle ABCD see Fig. Prove that $OB^2 + OD^2 = OA^2 + OC^2$.



31. A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 (see figure), and these are equally likely outcomes. What is the probability that it will point at



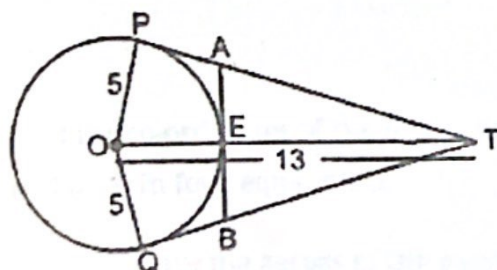
i. 8?

ii. an odd number?

iii. a number greater than 2?

iv. a number less than 9?

32. In the figure, O is the centre of a circle of radius 5 cm. T is a point such that $OT = 13$ cm and OT intersects the circle at E. If AB is a tangent to the circle at E, find the length of AB, where TP and TQ are two tangents to the circle.



33. The table below shows the daily expenditure on the food of 25 households in a locality.

Daily expenditure (in ₹)	100-150	150-200	200-250	250-300	300-350
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Number of households	4	5	12	2	2
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Find the mean daily expenditure on food by a suitable method.

34. The inner perimeter of a racing track is 400 m and the outer perimeter is 488 m. The length of each straight portion is 90 m and the end are semicircles. Find the cost of developing the track at the rate of Rs 12.50/m².
35. Find the value of k for which the system of the equation has infinitely many solutions:
 $kx + 3y = 2k + 1$
 $2(k + 1)x + 9y = 7k + 1$
36. From the top of a building AB, 60 m high, the angles of depression of the top and bottom of a vertical lamp-post CD are observed to be 30° and 60° respectively. Find the horizontal distance between AB and CD.

GENERAL INSTRUCTIONS

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EXAM-SPECIFIC INSTRUCTIONS